REMARKS

This is in response to the Office Action dated November 30, 2009. In view of the foregoing amendments and following representations, reconsideration is respectfully requested.

By the above amendments, claims 1 and 5 have been amended to more clearly define the novel features of the present invention. Thus, claims 1-11 are currently pending in the present application. Support for the amendments can be found at least in paragraphs 0039-0041 of the specification as originally filed.

On pages 2-3 of the Office Action, claims 1-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (JP2002-360672) and Lin et al. (U.S. Patent No. 5,876,666). It is submitted that the present invention, as defined in the amended claims, now clearly distinguishes over the Takahashi and Lin references for the following reasons.

Takahashi, in paragraphs [0020] and [0023], discloses a sterilization method including the following steps:

(a) evacuating and heating (100 Torr, 35-40°C);

(b) evaporating and introducing liquid hydrogen peroxide; and

(c) introducing ozone.

However, as acknowledged by the Examiner, Takahashi lacks any disclosure of generating plasma in hydrogen peroxide and ozone atmosphere within the chamber.

Lin '666, in col. 11, lines 14-48, discloses a method of hydrogen peroxide plasma sterilization including the following steps:

1. placing articles 56 in a chamber 30;
2. evacuating the chamber 30;
3. delivering hydrogen peroxide vapor into chamber 30;

4. sterilizing (evacuating) the articles by treating with peroxide vapor until sterilized or pretreating articles with peroxide vapor in chamber 30 before plasma with sufficient power to sterilized is generated; and

5. subjecting the articles to plasma by applying power.

However, none of the prior art references discloses or suggests the method of the present invention as defined in claim 1, which comprises the steps of: decompressing; supplying hydrogen peroxide; supplying ozone; sterilization; exhausting gas, and generating plasma.

In fact, Lin '666 discloses that the articles are subjected to plasma after delivering hydrogen peroxide.

Therefore, if the teaching of Lin '666 were applied in the Takahashi process, the step of subjecting the article to plasma would be performed after the step of introducing liquid hydrogen peroxide into the chamber, and before the step of introducing ozone. Clearly, absent the present application, there is no reason to subject the article to plasma after both the steps of introducing liquid hydrogen peroxide and introducing ozone.

Note that if the articles are subjected to plasma in only a hydrogen peroxide atmosphere, the hydroxy radicals cannot be generated enough, which will provide very little in the way of a sterilizing effect.

In the present invention, as defined in claim 1, the plasma is generated in a hydrogen peroxide and ozone atmosphere so that hydroxy radicals, generated by the plasma discharge, allow the object to be sterilized, and thus, greater sterilization effects can be expected.

Note, when plasma is generated in a hydrogen peroxide and ozone atmosphere, superoxides ($O_2 \bullet$) are produced by the reaction of oxygen and electrons.

$O_2 + e \rightarrow O_2 \bullet^-$

These superoxides are unstable and react with hydrogen peroxide to produce hydroxy radicals (OH•) and also react with water to produce HO_2 radicals ($HO_2 \bullet^-$) which are kinds of superoxides.

$O_2 \bullet^- + H_2O_2 \rightarrow OH \bullet + OH^- + O_2$

$O_2 \bullet^- + H_2O_2 \rightarrow OH_2 \bullet^- + OH^-$

The hydroxy radical (OH•) has a short lifespan and is unstable so that it reacts with oxygen radical (O •) to become a HO_2 radical ($HO_2 \bullet^-$). The HO_2 radical ($HO_2 \bullet^-$) has a long lifespan but is unstable so that it easily returns to hydroxy radical (OH•) and oxygen radical (O ·).

$O \bullet^- + OH \bullet \rightarrow HO_2 \bullet^-$

$O \bullet^- + OH \bullet \leftarrow HO_2 \bullet^-$

The oxygen radical (O ·) at the left side of above equation is generated from ozone while the hydroxy radical (OH•) is generated from hydrogen peroxide as described above. Both the oxygen radical (O ·) and the hydroxy radical (OH•) have large oxidizing powers and provide sterilizing activity, respectively. The HO_2 radical ($HO_2 \bullet^-$) at the right side of above equation does not have as large an oxidizing power as the oxygen radical (O ·) and the hydroxy radical (OH-) at the left side.

Thus, the state of the oxygen radical (O ·) and hydroxy radical (OH•) and the state of HO_2 radical ($H_2 \bullet^-$) are repeated to generate a synergistic effect of oxidizing power of both oxygen radical (O ·) and hydroxy radical (OH•), thereby enhancing the sterilization of the object.

Therefore, any combination of the Takahashi and Lin '666 references would not result in Applicant's invention as defined in independent claim 1.

Further, claim 5 requires, *inter alia*, a plasma generation unit for generating plasma in hydrogen peroxide and ozone atmosphere within said chamber after exhaust of gas so that the hydroxyl radicals generated by the plasma discharge allow the object to be sterilized. As discussed above, the applied prior art references do not teach or suggest a plasma generation unit for generating plasma in both hydrogen peroxide and ozone atmosphere. Thus, claim 5 is allowable over the collective teachings of the Takahashi and Lin '666 references.

Further, the applied Lin '828 and Destrez references have been reviewed, and it is apparent that these references do not disclose the claimed features that are omitted in the disclosures of Takahashi and Lin '666.

In view of the above, it is submitted that the present application is now clearly in condition for allowance. The Examiner therefore is requested to enter the above amendment and pass this case to issue.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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